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Union Carbide Nuclear Company, Oak Ridge Gaseous Diffusion Plant, Operating Contractor for the U.S. Atomic Energy Commission.

INTER-COMPANY CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY
Division of Union Carbide Corporation

To: ORGDP Criticality Hazards Committee Plant: Oak Ridge Gaseous Diffusion
Mr. K. W. Bahler Mr. D. M. Lang Date: March 20, 1959
Mr. R. M. Batch ✓ Dr. R. L. Macklin Subject: Uranium Accumulation,
Mr. E. C. Bollinger Mr. A. J. Mallett K-1420 Incinerator Stack,
Dr. A. D. Callihan Mr. J. A. Marshall Report No. 21
Mr. J. Dykstra Mr. J. A. Parsons KSA-167, Part 1
Dr. G. A. Garrett Mr. W. L. Richardson
Dr. H. F. Henry-RC Mr. M. F. Schwenn
Mr. A. P. Huber Mr. H. G. P. Snyder
Mr. K. M. Jones

Copies To:
Mr. L. B. Emlet
Paducah (Mr. R. G. Jordan - Mr. R. C. Baker)
ORNL (Dr. J. A. Swartout)
Y-12 (Mr. J. P. Murray - Mr. J. D. McLendon)
GAT (Mr. D. H. Francis - Dr. F. E. Woltz)

RC
FROM
K-1034

As a result of decreased efficiency in operation of the K-1420 incinerator stack blower,¹ an inspection was made on January 29, 1959, of the stack components. This inspection not only indicated the cause to be plugged louvers in the filter cone of the primary fly ash collector system, installed principally for contamination control, but revealed unsuspected uranium accumulations on the support base of the filter cone and between the firebrick wall enclosing the cone unit and the outer wall of the stack. Since the contaminated combustible materials processed through the K-1420 incinerator have always originated principally from low enrichment locations, previous isotopic analysis of the ash indicating maximum enrichment of less than 1.5%, there seemed little possibility that this accumulated material would have a higher value. However, it was removed and handled in safe containers and was later processed through normal uranium recovery facilities. With the exception of a small wet area on one wall, probably due to the blowing of rain under the narrow opening of the stack cover, the material was dry and, being residual fly ash from the cone collector, had a very low average density, later found to be about 1.47 g./ml. A total of approximately 249 lb. of ash was removed from the stack components; based on laboratory analysis of a composite sample, this contained 34.8 lb. of uranium at a U-235 enrichment of 1.14%, which confirmed the estimate of a low enrichment.

Nuclear Safety

At the indicated U-235 enrichment of the recovered material, the quantity of U-235 contained therein was slightly less than 400 g., which is approximately 3% of the safe mass at this level and only slightly above the safe

¹ Henry, H. F., Contaminated Waste Disposal, 1-20-56 (KSA-23)

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This document has been approved for release to the public by:

Asst. Technical Information Officer 7/25/96
Oak Ridge K-25 Site Date

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mass for maximum enrichment. Thus, this accumulation could not have resulted in a nuclear hazard. It should be noted, however, that the accumulation was not only unsuspected but it occurred in geometrically unsafe equipment, and the available volume was apparently the only limitation to the quantity that could have accumulated. Had the major portion of contaminated combustibles originated from areas of high enrichment, the nuclear hazard of the operation would have been increased. Nuclear safety would then be contingent not only on low material density but on the probability of low moderation as a result of either the furnace operation or the material location, or both.

Conclusion

The Review Committee consisting of Messrs. E. C. Bollinger, J. Dykstra, and R. Clouse of the Chemical Division, and Dr. H. F. Henry and Mr. A. J. Mallett of the Industrial Relations Division were in agreement that the quantity of U-235 accumulated did not present a nuclear safety problem, as such, but the fact that the accumulation was unsuspected warranted dissemination of information concerning the incident.

The Committee was also of the opinion that the equipment and operation changes indicated below will eliminate the occurrence of a similar incident at this location.

1. Hinged grate openings to permit removal of ash accumulations will be provided at both the level of the cone support, and at opposite sides of the base of the stack.
2. An inspection schedule will be established.
3. Periodic removal of the stack cover will be made for the detection and removal of any accumulation on the stack walls.

It also recommended that prompt notification concerning the possibility of an accumulation be made to other uranium processing facilities having similar equipment.

Note: It was later found that a similar accumulation had also occurred at another location using similar equipment.

AJM:vr


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Safety, Fire, and Radiation Control

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INTER-COMPANY CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY

Division of Union Carbide Corporation

Union Carbide Nuclear Company, Oak Ridge Gaseous
Diffusion Plant, Operating Contractor for the U.S.
Atomic Energy Commission

To: ORGDP Criticality Hazards Committee

Plant: Oak Ridge Gaseous Diffusion

Mr. K. W. Bahler
Mr. R. M. Batch
Mr. E. C. Bollinger
Dr. A. D. Callihan
Mr. J. Dykstra
Dr. G. A. Garrett
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Mr. K. M. Jones

Mr. D. M. Lang
Dr. R. L. Macklin
Mr. A. J. Mallett
Mr. J. A. Marshall
Mr. J. A. Parsons
Mr. W. L. Richardson
Mr. M. F. Schwenn
Mr. H. G. P. Snyder

Date: January 22, 1960

Subject: Uranium Accumulation - K-1302
Vent Stack, Report No. 22

KSA-228, Part 1

PRD-1

Copies To:

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It was noted on October 13 that UF₆ in concentrations as high as 500 ppm. of uranium was being discarded in the vent gases of the K-1420 oxide fluorination facility. The unit was temporarily shut down, and, since the vent gases discharge to the K-1302 stack, a visual inspection of this unit was made on October 15. This inspection revealed a deposit which covered the base of the stack and the floors of the 2 air supply entrance ducts to depths varying from 1/2" to 5"; this stack was routinely and formally inspected on a quarterly basis, the last inspection being made on September 28. At that time, it was found to have no accumulation. The material was removed, stored in safe containers, and was later processed through the K-1420 uranium recovery system. Subsequent analysis of composite samples from the collector units indicated a total uranium and U-235 content of 26,069 g. and 853 g., respectively, at an average enrichment of 3.27% and a maximum enrichment of 3.456%. These values are consistent with the materials processed between September 28 and October 13.

Nuclear Safety

With the exception of a few places against the walls of the ductwork supplying air to the stack, the slab depths noted were below the allowable limit for the maximum U-235 enrichment reported, and the indicated U-235 content of 853 g. was less than the safe mass for this enrichment. Thus, this accumulation could not have resulted in a nuclear hazard. However, the stack components are of unsafe geometry, and the accumulation was unsuspected in that it had deposited in a shorter time interval than inspections were scheduled. However, the concurrent vent gas sampling and analysis program permitted its discovery prior to trouble.

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Mr. L. B. Emlet

Information Officer

K-25 Site

Date 2-19-81

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Conclusion

The Review Committee consisting of Messrs. J. Dykstra and A. Varlan of the Chemical Division; W. McCluen and L. Allen of the Process Engineering Division; and H. F. Henry and A. Mallett of the Industrial Relations Division were in agreement that the accumulation as such did not present a nuclear safety problem, but the fact that it was unsuspected warranted its consideration as a significant non-critical incident. The most probable causes of the carryover appeared to be too-rapid passage of the UF₆ through the freeze-out cycle of the fluorination operation, or defective cylinder entrance lines permitting improper gas flow. The Committee was also of the opinion that the possibility of such an accumulation will be considerably less likely in the future due to changes in the facility design and the type of cold trapping equipment which will be used in the new oxide fluorination facility. Further, plans already under way include the installation of a continuous UF₆ monitor on the effluent gases from the fluorination system. Also considered was a long-term accumulation in the vent line and the blowing of material to the stack when the vent line was used in another operation; however, no evidence of such accumulation was indicated on inspection of the vent line at 5 locations.

The Committee made the following recommendations as additional safeguards:

1. Permanent flanges should be installed at specific locations in the vent line to permit frequent inspections.
2. Inspections of the stack components should be more frequent than the present quarterly schedule. In this respect, consideration should be given to the installation of portholes and lights which would enable visual inspection of the interior of the stack and ductwork without entry since the unit also serves as a vent system for adjacent facilities where corrosive chemicals are stored.

AJM:vr


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Safety, Fire, and Radiation Control

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